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ABSTRACT

A study tested the feasibility of a task-analytical instructional approach to developing vocational skills for severely and profoundly retarded individuals. During the study, each of 43 severely and profoundly retarded individuals received twelve 15-minute individual training sessions on each of four selected vocational tasks (the Stromberg Dexterity Test, the Bennett Hand Tool Test, the VIEWS Screen Assembly, and the VIEWS Faucet Assembly). During each training session, subjects were guided through a series of analytically task-defined steps necessary for the successful completion of the task, and the trainer recorded the type of prompt that was required to gain successful performance. Analysis of the degree of independence achieved for the completed steps in each training task provided clear and consistent evidence of the effectiveness of the training. Pretest and posttest analyses also indicated improvements in overall fine motor skills as a result of training. The results of the study were interpreted as providing clear evidence of the utility of systematic training for remediating perceptual and motor defecits in severely and profoundly retarded adults. (MN)

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FINAL REPORT

OF

AN INSTRUCTIONAL APPROACH TO TRAINING SEVERELY AND PROFOUNDLY RETARDED PERSONS IN VOCATIONAL SETTINGS

1982 - 83

American Institute for Mental Studies
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LEGAL NAME OF APPLICANT DISTRICT, INSTITUTION OR AGENCY: American Institute for Mental Studies

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ABSTRACT

DESCRIPTION OF PROJECT

(Use this sheet and no more than one other to type in single-spaced form a statement of project objectives, procedures that were followed, state and local priorities emphasized and the expected contribution of the project to vocational education.)

Forty-three (43) severely and profoundly retarded individuals participated in this study, which was designed to test the utility of a task-analytic instructional approach to developing vocational skills for this group. Each subject received twelve (12) 15-minute individual training sessions on each of four selected vocational tasks (Stromberg Dexterity Test, Bennett Hand-Tool Test, VIEWS Screen Assembly and VIEWS Faucet Assembly). During each training session, subjects were guided through a series of task-analytically defined steps necessary for successful completion of the task, and the trainer recorded the type of prompt (verbal prompt, gestural prompt or physical assistance) that was required to gain successful performance. The Motor Factor tests of the McCarron-Dial Inventory were used as a pre-test to assign subjects to high versus low functioning groups, and also as a post-test to assess overall gains as a result of training.

For data from the individual training sessions, the types of prompts used were assigned numerical values, with higher scores indicating greater degrees of independent functioning. Analysis of the degree of independence achieved for completed steps in each training task provided clear and consistent evidence of training effectiveness. Although initially high functioning subjects outperformed those from the lower functioning group, each of the form training task analysis indicated significant performance improvements across training sessions. Pre versus post-test analysis also indicated improvements in overall fine motor skills as a result of training.

The results of the study were interpreted as providing clear evidence of the utility of systematic training for remediating perceptual-motor deficits in severely and profoundly retarded subjects. Implications of such a training approach in the development of cost-effective vocational training programs for this population are also discussed.

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An Instructional Approach to Training Severely and Profoundly Retarded Persons in Vocational Settings

INTRODUCTION

Severely and profoundly retarded persons often do not progress in pre-vocational and vocational programs because, among other factors, they lack the perceptual-motor abilities to complete the various tasks presented. Vocational programs for such residents often are found to provide less actual training than simple exposure to rather uncomplicated tasks. For example, Gold (1973) has noted that vocational programming for severely and profoundly retarded residents most often "refers to placing clients on a job situation where it is hoped training occurs" (p.100).

Additionally, this group of residents is often unable to take part in on-going contract work involving complex tasks because they are unable to either (a) successfully complete the sub-tasks of the job, or (b) assemble the sub-tasts into a finished operation to produce a product. Since most sheltered work settings are based on contract work, severely and profoundly retarded individuals are often excluded from participation. While the normalization movement and the trend toward deinstitutionalization has led to the development of expanded training experiences for higher functioning individuals, little attention has been paid to the vocational training of severely and profoundly retarded people because of their extensive response deficiencies. Among these deficiencies are poor attention span, distractability, limited cognitive skills and poor motor coordination (Whitman and Scibak, 1979).

For the most part, work with this group has focused on increasing output (i.e., production rate) with relatively less attention devoted to expanding vocational skills. Since significant deficits in both fine and gross motor skills are widely characteristic of severely and profoundly retarded persons, the problem of programmatic intervention is two-fold. First, specific work skills must be isolated and changed and, second, a reliable and efficient training methodology needs to be developed.

Research studies have appeared that take the first steps toward solving this dual problem. However, for the most part, these studies have emphasized manipulation of specific variables (e.g., visual attendance, Karen, Eisner, & Endres, 1974; motivational factors, Bateman, 1975 and Teasdale and Joynt, 1967; specific task training, Gold, 1972; or reinforcement schedules, Schroeder, 1972). While these studies provide a basis for further work, it is clear that a comprehensive, systematic technology for vocationally training the severely and profoundly retarded has not yet been developed (Whitman and Scibak, 1979).

The present research represents an initial attempt to integrate the types of research findings noted above with an instructional training methodology found useful in other contexts (Belmont & Butterfield, 1977). This model was extended to begin exploring its utility for routine habilitative training in a vocational setting. The two-fold problem described above, then, provides the rationale for the present research. First, a clear continuum of perceptual-motor functions ranging from fine motor to gross motor abilities was established. For each point in this

range a specific task was developed drawing on existing tests/measures and expanding them to coincide with various levels of motor skills. Second, a specific training method was established using a task-analytic instructional approach (Belmont & Butterfield, 1977). Included in this training method were various levels of instructional aids (verbal and gestural prompts, modelling, and physical guidance). Taken together these two components provide information on two crucial aspects for program development, namely (1) specific motor skill deficits and their remediation, and (2) a preliminary teaching model for practical application.

METHOD

Subjects and Design

A total of 43 severely and profoundly retarded residents of the American Institute for Mental Studies participated in this research project. Three residents developed medical problems which made it impossible to participate throughout all phases of the study, while two additional residents were disenrolled shortly before the project was completed. A total of 38 residents, then, completed all phases of the study. In the few cases where a resident's absence resulted in missing data, average scores for that resident's group were used as a substitute.

One half of the residents (the experimental group) received training on enlarged versions of selected vocational work samples, while the remaining residents (the control group) received equal amounts of training on normally sized materials for the same work samples. Based on pre-test assessments of gross and fine motor skills, each of the groups was subdivided into equal sized groups of high and low functioning residents. Overall, then, the study used a 2 (groups) x 2 (functioning level) factorial design.

Materials

Four sets of materials (Stromberg Dexterity Test, Bennett Hand Tool Test, VIEWS Screen Assembly, and VIEWS Faucet Assembly) were used as training materials in this study. For subjects in the experimental group, two sets of enlarged materials (approximately double and triple normal size) were constructed. Normally sized materials from those work samples were also used in training.

Initially, materials from the 16 work samples of the VIEWS evaluation system were also used for pre- and post-test assessment materials. Many residents, however, were unable to perform well enough to obtain scores using those materials. As a result, the Motor Factor tests of the McCarron-Dial Inventory were also used for pre- and post-test assessments.

Training Sessions

Each participant in the study received 12 individual training sessions on each of the four selected work samples, for a total of 48 15-minute

sessions. Residents assigned to the experimental group received four training sessions with each set of large materials, four with each medium-sized set of materials, and four sessions using standard size materials. Residents in the control group received all training sessions using standard-sized materials.

Each of the training samples was broken down into a series of steps necessary for successful completion of the work sample, based on a detailed task analysis of each sample. During any given training session, the resident was guided through completion of as many of these steps as were possible to complete. The trainer used successively more informative prompts (verbal prompts, gestural prompts, and physical assistance) to insure performance of each step. The trainer also noted the type of prompt necessary to gain successful performance.

Procedure

Before any training sessions were conducted, all residents involved in the study were pre-tested using the McCarron-Dial Inventory and appropriate materials from the VIEWS evaluation. A block assignment procedure, based on a rank ordering of pre-test scores, was used to insure that overall motor skills were evenly distributed across the experimental and control groups. A median split procedure was then used to subdivide the groups into high vs. low functioning residents. Overall motor-skills, then, among the experimental and control subjects were comparable when the study began.

All of the residents participating in the study were assigned to the same pre-vocational training program over the course of the study. Residents were removed from that program for their individual training sessions on a rotating basis. Depending on the particular training task being used, approximately 12-15 residents received individual training each day.

During each training session, a resident was given the opportunity to perform the initial step of the training task. If unsuccessful, a verbal prompt to perform that step was given by the trainer. If still unsuccessful, a gestural prompt was added. Finally, if the step had still not been performed, physical assistance was used to guide the resident through that step. The same procedure was followed for each additional step in the task, and training continued for a 15-minute time period. As the training was being conducted, the trainer recorded the level of prompt necessary for each step.

After all training sessions on the four work samples had been completed, post-test assessments of each resident were conducted. Again, the McCarron-Dial Inventory and selected VIEWS materials were used for this purpose.

RESULTS

The results of the study are presented in two major sections. First, the results from each of the four training tasks are presented individually. Second, the effects of the training on overall motor skills, as measured by pre- and post-test assessments, are presented.

For data from the individual training sessions, each of the possible prompt types was assigned a numerical value, with higher scores indicating greater independence. If a resident performed a task step independently, that step received a score of "4". Steps completed with a verbal prompt received a score of "3", while steps requiring gestural prompts and physical assistance received scores of "2" and "1", respectively. In cases where a resident could not perform a task step despite receiving physical assistance, a score of "0" was given.

During training sessions, it was noted that some residents relied heavily on physical assistance but completed many steps, while others worked slowly but independently. To remove differences due to speed of performance, the average score per step completed was derived for each training session. These scores were used for the analysis reported below.

For experimental subjects, it was also noticed that performance sometimes declined during the first session with a new size of materials as residents adjusted to the change. To reduce the effects of such variation in the data, average scores for sessions 1-4, 5-8, and 9-12 were also calculated. These average scores per block of training sessions became the major data for the training analysis.

For each of the four training tasks, then, the average scores per block of training were analyzed using a 2 (groups) x 2 (functioning level) x 3 (training block) ANOVA with repeated measures on the training block variable. If residents improved their performance as a result of training, significant effects due to training block would clearly be expected. Effects due to functioning level would also be expected, as high functioning residents should clearly outperform lower functioning residents. Finally, if the larger material sizes were more effective for training purposes, effects due to group should be evident.

(1) Stromberg Dexterity Test. Results from the Stromberg training sessions, which was the initial task all subjects were trained on, indicated that high functioning residents did indeed outperform low functioning residents. Averaged over all training sessions, the mean score for high functioning residents (1.86) was significantly higher than for low functioning residents (1.30), $F(1,36) = 12.77$, $p<.01$. The performance of all subjects also increased across training blocks, $F(2,72) = 10.22$, $p<.01$. The average scores across training blocks for all subjects were 2.16, 2.31, and 2.37, respectively. The experimental subjects, however, did not perform significantly better than did the control subjects. Figure 1 shows the comparative improvements across training blocks for the high and low functioning resident groups.

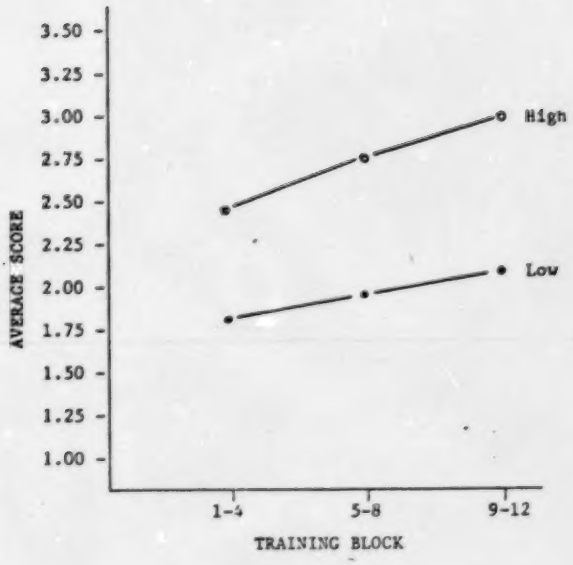

FIGURE 1. Average score per training block, high vs. low functioning groups, Stromberg-Dexterity Test.

(2) VIEWS Screen Assembly. Results from this second training task were, in essence, identical to those of the Stromberg. Again, subjects in the high functioning groups had higher overall mean scores (3.18) than did subjects in the low functioning groups (1.84), $F(1,36) = 26.60$, $p < .01$. Improvements in average scores across the three training blocks (mean scores of 2.26, 2.57, and 2.70) were also significant, $F(2,72) = 34.37$, $p < .01$. Overall performance among the experimental group, however, was essentially identical to performance among subjects in the control group. Figure 2 reflects the improvements across the three training blocks for subjects in the high and low functioning groups.

(3) Bennett Hand Tool Test. Similar data patterns were found in the results of training on this third of the four training tasks in the study. Subjects in the high functioning groups had significantly better performance (mean score equals 2.59) than lower functioning subjects (mean equals 1.84),

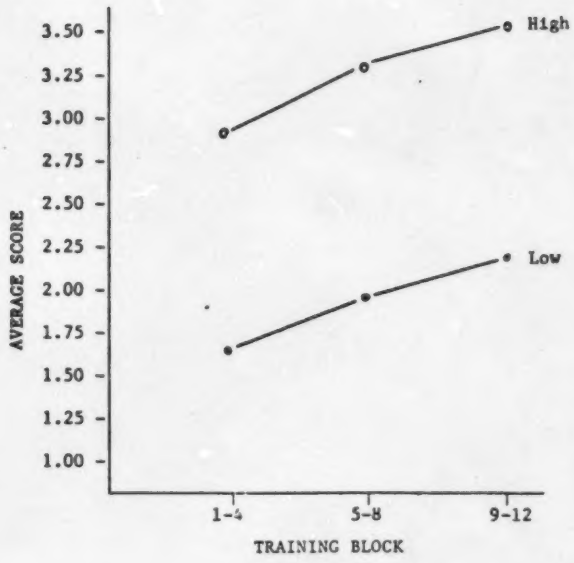

FIGURE 2. Average score per training block, high vs. low functioning groups, VIEWS Screen Assembly Task.

$F(1,36) = 13.41$, $p<.01$. Averaged across all subjects, performance increased over all three training blocks were 1.98, 2.29, and 2.37, respectively. Figure 3 shows the overall performance improvements for high and low functioning residents.

(4) VIEWS Faucet Assembly. On the final task used for individual training sessions, results similar to those reported for earlier tasks were obtained. The mean performance among high functioning residents (2.32) was significantly greater than among low functioning residents (1.36), $F(1,36) = 26.29$, $p<.01$. Similarly, the performance of all subjects improved across the three training blocks (means were 1.61, 1.86, and 2.06, respectively), $F(2,72) = 57.14$ $p<.01$. Figure 4 reflects performance across the training blocks for the high and low functioning groups. Again, however, there was essentially no difference in performance attributable to the size of training materials that were used.

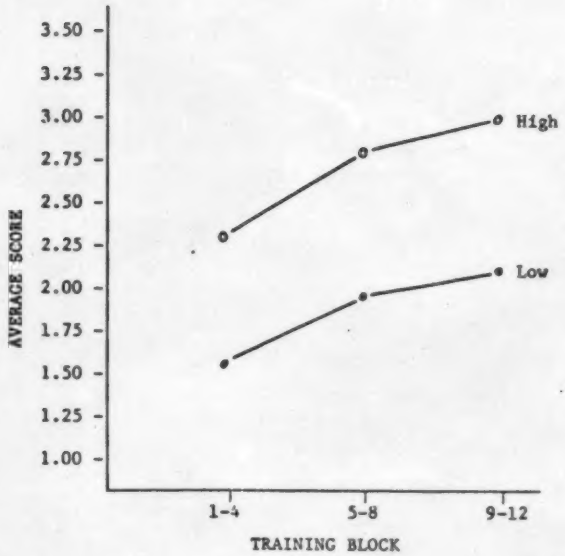

FIGURE 3. Average score per training block, high vs. low functioning groups, Bennett Hand Tool Test.

Taken together, the results presented above provide clear and consistent evidence of the effectiveness of the training procedure used in this study. Although severely and profoundly retarded individuals are usually considered unable to complete standard vocational assessment tasks, the residents in this study showed consistent gains in performance on the work sample used. Further evidence of the training effectiveness can be found in the results of the pre- and post-test analyses.

(5) McCarron-Dial Inventory. The primary measure of fine and gross motor skills used in this study was the McCarron-Dial, which provides separate raw scores for fine and gross motor. Initially, a 2 (experimental phase) x 2 (experimental group) x 2 (functioning level) ANOVA was used to examine the pre- and post-test results. That analysis indicated that high functioning residents outperformed lower functioning residents, $F(1,36) = 52.75$, $p < .01$. The results also indicated that, on the average, residents improved their overall motor skills from the pre-test (mean score = 177.40) to the post-test (mean score = 201.20), $F(1,36) = 4.95$, $p < .05$.

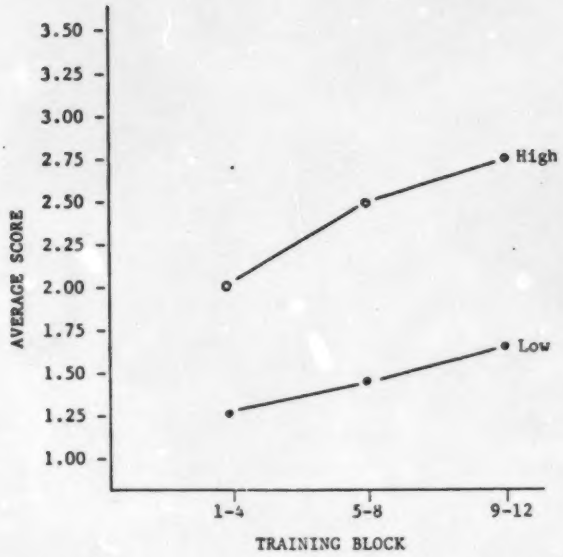

FIGURE 4. Average score per training block, high vs. low functioning groups, VIEWS Faucet Assembly Task.

In an attempt to determine where the major gains in motor skills had been achieved, separate analyses were conducted for the gross and fine motor skills subtests of the McCarron-Dial. Since most of the vocational tasks used in the study emphasized fine motor over gross motor, more of the gains might be expected in those areas.

For gross motor skills, mean performance improved slightly, but not significantly, from the pre-test (mean = 60.62) to the post-test (mean = 64.17). Higher functioning residents did perform better than lower functioning residents, $F(1,36) = 19.41$, $p<.01$, but no other results of the analysis were significant.

In the analysis for fine motor skills, however, clear effects of training could be found. As would be expected, higher functioning residents outperformed lower functioning residents, $F(1,36) = 62.91$, $p<.01$.

More importantly, the analysis indicated a significant improvement in overall fine motor performance from the pre-test (mean = 117.02) to the post-test (mean = 137.15), $F(1,36) = 4.63$, $p<.05$.

(6) VIEWS Work Samples. As mentioned earlier, the study originally intended to use results from the VIEWS work evaluation assessment as an additional measure of performance improvements due to training procedures. Many of the 16 separate work samples in the VIEWS assessment, however, require fairly sophisticated cognitive skills for successful and complete performance. The vast majority of the residents in this study lack those cognitive skills and thus were unable to complete the VIEWS evaluation tasks independently. No usable data, then, were obtained from these measures.

SUMMARY AND DISCUSSION

The overall results of this study provide clear support for the contention that perceptual motor deficits in severely and profoundly retarded individuals can be remediated through systematic training. Specifically, improvements in fine motor skills were attained by all subjects as shown through improvements in scores for task-specific measures (i.e., Stromberg, VIEWS Screen Assembly, Bennett, and VIEWS Faucet Assembly) as well as generalized improvement in a pre- and posttest measure (McCarron-Dial). The consistency of the improvements across four separate training samples is striking and suggests that real behavior change was affected as opposed to mere practice effects.

An argument can be made that the consistent improvement across training tasks as well as the pretest-posttest improvement was due to increasing familiarity with the trainer and/or the training/testing situation. However, this does not seem likely for at least two reasons. First, the evaluator who conducted the pre- and post-testing was not the same individual that conducted the training sessions. Second, improvement is found specifically on fine motor portions of the McCarron-Dial. That is, increased scores are not distributed across all the subtests of this instrument, but are restricted to subtests that tap fine motor skills similar to the training tasks. Taken together then, these points support the conclusion that real behavior change has occurred through training on specific tasks, and that this change is detectable even on a generalized test instrument (McCarron-Dial).

While the training material size variable did not produce significant training differences, it did not hamper performance either. It would seem from these results that the size of the training materials is less important than aspects of the training itself. Recall that a very specific one-to-one instructional approach was used in this study and that the approach included a sequential system of verbal and non-verbal prompts. From the present study, it appears that this approach may be a valuable tool in pre-vocational and vocational programs for severely and profoundly retarded individuals in that improvements were found across several different types of tasks and material sizes, and was marked enough to produce significant pretest-posttest differences.

Furthermore, it should be noted that the improvements in fine motor skills in this study were achieved with relatively little training time. Throughout the course of the year-long study, each subject received only 12 hours of individual training and this time was divided amoung four tasks. Despite only three hours of training per task, significant behavior change was achieved. Given these findings, it seems most reasonable to assume that even more efficient training situations could be developed (e.g., short-duration, intense individual instruction leading to small group instruction and thence to large group work). Empirically tested and evaluated for cost-effectiveness such an instructional methodology could prove to be a powerful habilitative approach in a heretofore largely ignored population.

In summary, then, it seems that at least one group of skills (motor coordination) normally found deficient for severely and profoundly retarded persons in vocational training settings (Whitman & Scibak, 1979) can be improved using the approach described here. In addition, it is clear that the hopeless stance taken toward these individuals (i.e., Gold, 1973) is no longer tenable. With appropriate task refinement and training, skill development can be accomplished. Further research is needed to delineate the most cost-efficient approaches to developing the training methodology used here into a standard training package for pre-vocational and vocational programs.

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